



Clarifying Persistent Organic Pollutant Concentration Trends in the Biomonitoring of Long-Lived Organisms: the Roles of Age, Lifespan, and Sex

Matthew J. Binnington¹, Frank Wania¹

¹Department of Physical and Environmental Sciences, University of Toronto Scarborough, Toronto, Ontario, Canada M1C 1A4



Background

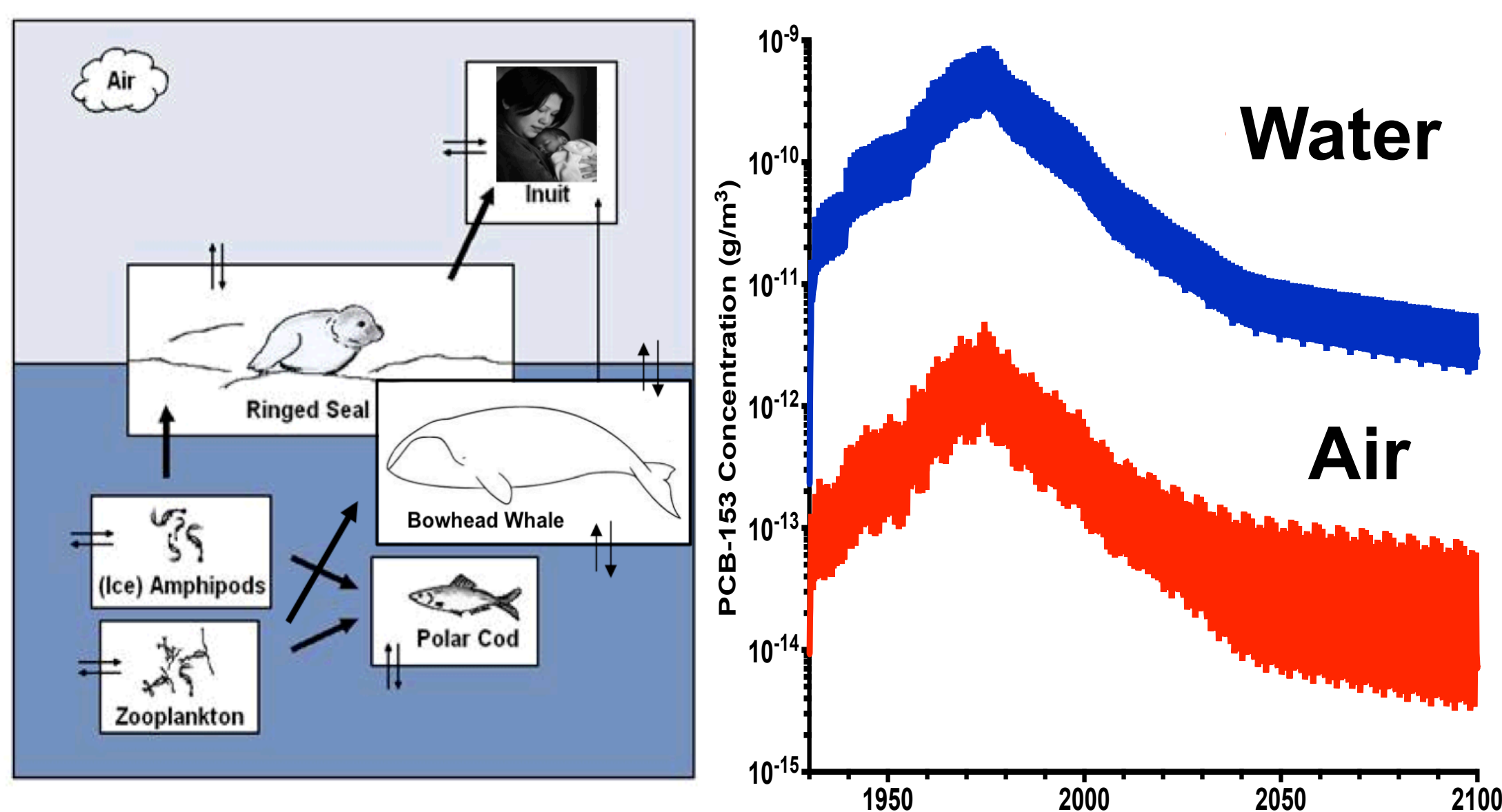
Long-lived mammals are frequently used for the biomonitoring of persistent organic pollutants (POPs). POP levels in sampled populations are often plotted against age¹ and interpreted as if they reveal information on the contamination of individuals as they age.

However, typical biomonitoring studies identify **cross-sectional body burden age trends (CBATs)**, which are obtained when individuals of different ages are sampled at the same time. CBATs should not be confused with **longitudinal body burden age trends (LBATs)**, which apply to individuals sampled repeatedly over time.² While the relationship between LBATs and CBATs in humans has been explored^{2,3}, we focus here on wildlife, also clarifying the impacts of variable lifespan and sex on CBAT-LBAT relationships.

Methods

The Arctic version of the mechanistic bioaccumulation model ACC-Human³ was used to derive LBATs for PCB-153 in individuals living in the Arctic and born at different times relative to time-variant historical environmental contamination (i.e. Arctic air and sea water calculated with a global transport model⁴). From these, CBATs were calculated².

Arctic ACC-Human Concentrations in...



This analysis was performed for male and female ringed seals, humans, and bowhead whales with life spans of 40, 80, and 160 years, respectively. The effects of lifespan and gender on LBAT-CBAT relationships were compared between organisms. Polar cod were also included in some examinations given their much shorter lifespan of 6 years.

References

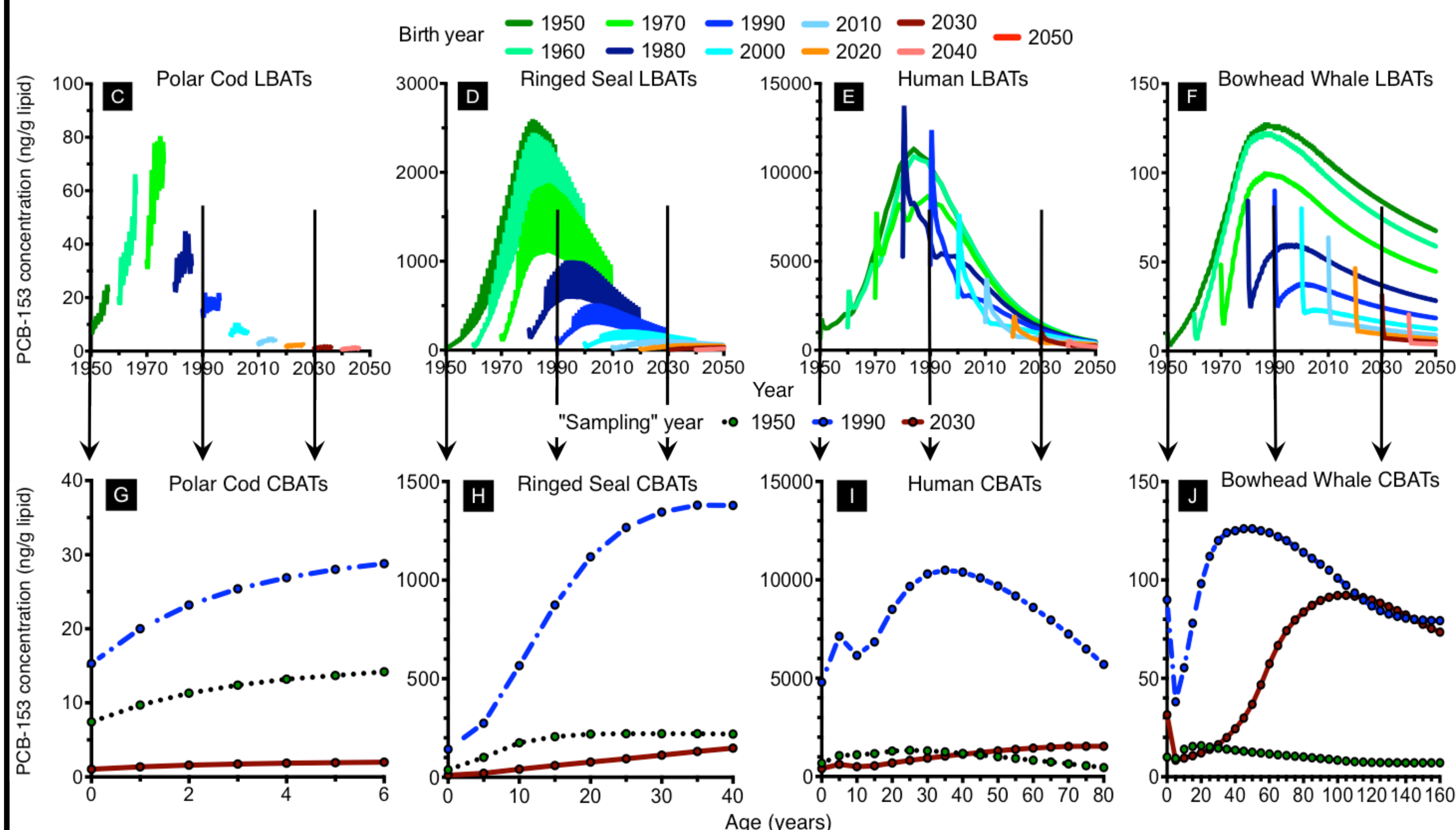
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Contact: matt.binnington@utoronto.ca, frank.wania@utoronto.ca

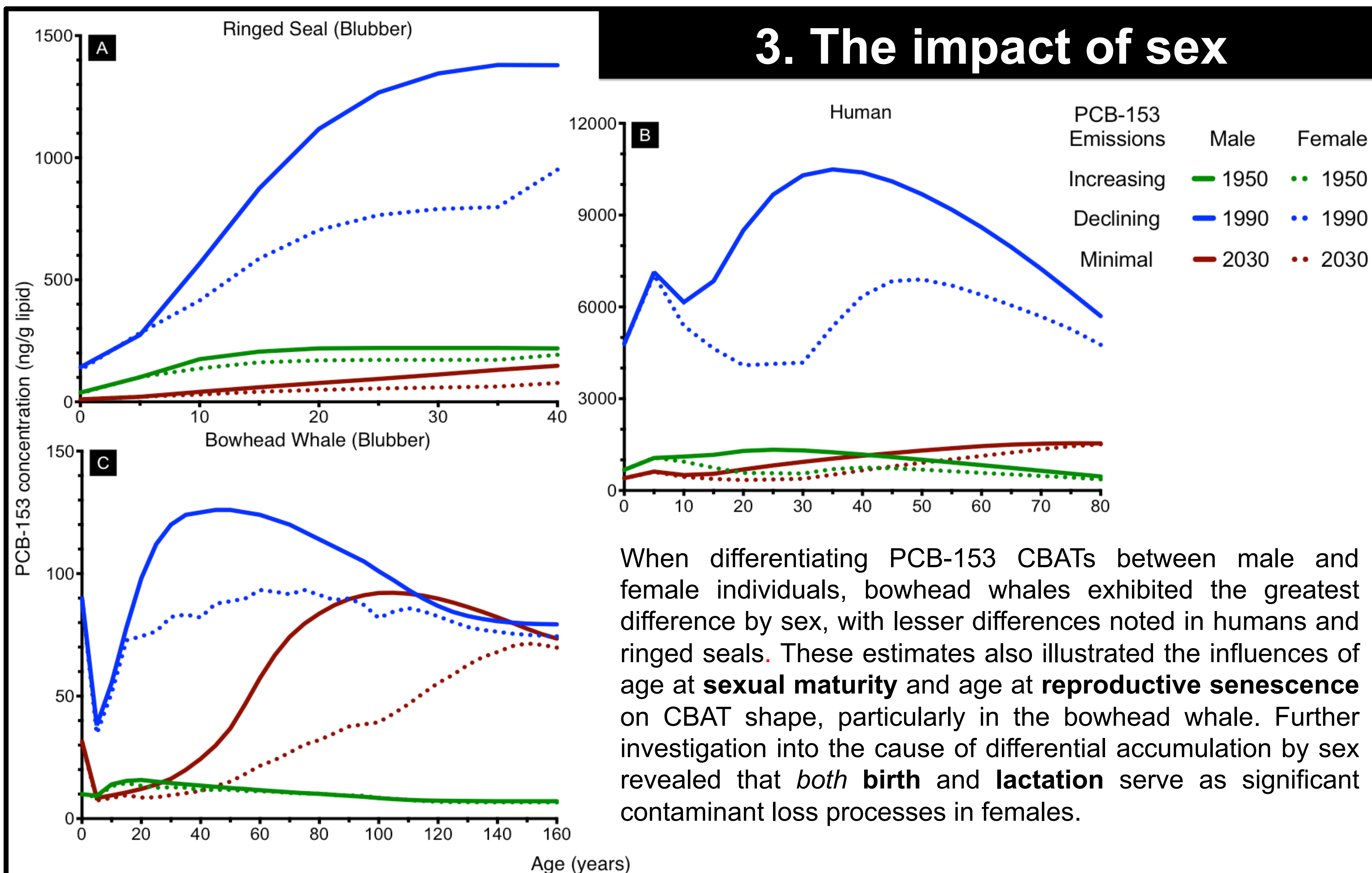
1. The relationships between organism LBATs and CBATs



Year of population sampling relative to the year of peak Arctic PCB-153 concentrations (1974) chiefly determined CBAT shape - termed **Birth Cohort** effect.

Distinct trends of curve shape were found for years characterized by **increasing**, **decreasing**, and **minimal** PCB-153 environmental levels.

3. The impact of sex



2. The impact of lifespan

